Roll No. _____

IET, Dr. Shakuntala Misra National Rehabilitation University, Lucknow

Department of Electrical Engineering

Sessional Test - 1

Sem & Year: 4th Sem, 2nd Year

Subject: Instrumentation & Process Control

Duration: 90 Minutes

Code: TEE403

Max. Marks: 20

Instructions:

- Attempt all questions in Part A
- Attempt any two questions from Part B

Part A MCQs (1×4=4 Marks)

1. What is a transducer?

   a) A device that converts energy from one form to another

   b) A device that only measures physical quantities

   c) A device that only controls physical quantities

   d) A device that has no role in energy conversion

2. Which of the following is NOT a type of transducer?

   a) Thermocouple

   b) Strain gauge

   c) Ammeter

3. Active transducers are:

   a) Transducers that require external power to operate

   b) Transducers that do not require external power to operate

   c) Transducers that only measure temperature

   d) Transducers that only measure pressure

4. Which transducer converts sound waves into electrical signals?

a) Thermocouple

b) Strain gauge

c) Microphone

d) LVDT

Part B (2×8=16 Marks)

1. (a) An LVDT has a secondary voltage of 6.0V for a displacement of ±12.0mm. Determine the output voltage for a core displacement of 8.0mm from its central position. (4)

   (b) Explain the working of LVDT transducer. (4)

2. An LVDT is used for measuring the deflection of a bellows. The sensitivity of LVDT is 40V per mm. The bellows is deflected by 0.120mm by a pressure of 0.8×10^6 N per m^2. Determine the sensitivity of the LVDT in V per N/m^2 and the pressure when the voltage output of LVDT is 3.5 V. (8)

3. What are the different types of Thermistors, give its applications and working. (8)

SEMESTER END EXAMINATION, MAY, 2024

Course Name: - B.Tech(EE) **Semester:- 4**

Paper Name: - INSTRUMENTATION & PROCESS CONTROL **Paper Code:- TEE403**

Time - 3 Hrs + 20 minutes per hour extra time for V.I. & examinees with writer. **Max Marks-70**

समय– 3 घण्टे + 20 मिनट प्रति घंटे अतिरिक्त–दृष्टिबाधित एवं सह लेखक परीक्षार्थियों के लिए। अधिकतम अंक–70

Instructions:

- The question paper consists of three sections namely A, B, C. All sections are compulsory.
- Section A- Each question carries **3 mark. All questions are compulsory.**
- Section B- Answer any **5 out of 7** given questions in maximum one hundred fifty (150) words. Each question carries **7 marks.**
- Section C- Answer any **2 out of 3** given questions in maximum three hundred (300) words. Each question carries **10 marks.**

निर्देश:

- प्रश्न पत्र में तीन खण्ड अ, ब, व स हैं। सभी खण्ड अनिवार्य हैं।
- खण्ड–अ में प्रत्येक प्रश्न **तीन अंक** का है। **सभी प्रश्न अनिवार्य हैं।**
- खण्ड–ब में **सात प्रश्नों में से किन्हीं पाँच** प्रश्नों के उत्तर अधिकतम 150 शब्दों में दें। प्रत्येक प्रश्न **सात अंक** का है।
- खण्ड–स में **तीन प्रश्नों में से किन्हीं दो** प्रश्नों के उत्तर अधिकतम (250-300) शब्दों में दें। प्रत्येक प्रश्न **10 अंक** का है।

Section – A (खण्ड–अ)

Objective Questions(वस्तुनिष्ठ प्रश्न)

1. Answer all the following questions. **5x3 =15**

निम्नलिखित सभी प्रश्न अनिवार्य हैं।

i) Which of the following is a type of wireless communication protocol used in process control?

a) HART b) Wireless HART c) Profibus d) Modbus

ii) Which of the following is NOT a type of temperature sensor?

a) Thermocouple b) Resistance Temperature Detector (RTD)

c) Thermistor d) Venturi tube

iii) A thermocouple has a sensitivity of 40 μV/°C. If the measured voltage is 12 mV, calculate the temperature in °C.

a) 150 °C b) 300 °C c) 480 °C d) 600 °C

iv) A _____ is used to convert a non-linear signal into a linear signal.

a) Transmitter b) Transducer c) Linearizer d) Positioner

v) Which of the following is an example of an inferential measurement?

a) Measuring temperature with a thermocouple b) Measuring pressure with a Bourdon tube

c) Measuring flow using an orifice plate d) Measuring density using a Coriolis meter

Section – B (खण्ड–ब)
Short Answer Questions (लघुउत्तरीय प्रश्न)

2. Answer any five of the following questions in maximum 150 words. **5x7=35**
निम्नलिखित में से किन्हीं **पाँच** प्रश्नों के उत्तर अधिकतम 150 शब्दों में दें।

i. Explain the working of Capacitive Transducers and give its applications.

ii. Explain the working of Inductive Transducers and give its applications.

iii. Describe the operation of an LVDT.

iv. What is an Electrical Transducer? Give the classification of Transducers.

v. Draw and explain the basic block diagram of CRO.

vi. Draw and explain the basic block diagram of Telemetry System.

vii. An LVDT has a secondary voltage of 6.0V for a displacement of ±12.0mm. Determine the output voltage for a core displacement of 8.0mm from its central position.

Section – C (खण्ड–स)
Descriptive Questions (विवरणात्मक प्रश्न)

3. Answer any two of the following question in maximum 300 words. **2x10=20**
निम्नलिखित में से किन्हीं दो प्रश्नों के उत्तर अधिकतम 300 शब्दों में दें।

i) Explain the working principle of a pressure transmitter. Describe how it converts pressure into an electrical signal and transmits it to a control system.

ii) What is RVDT? How does it differ from an LVDT? Give its construction and explain how it can be used for measurement of angular displacement and its direction.

iii) An LVDT is used for measurement of deflection of a bellows. The sensitivity of LVDT is 60 V per mm. The bellows is deflected by 0.125 mm by a pressure of 0.8×10^6 N per m^2. Determine the sensitivity of the LVDT in V per N/m^2 and pressure when the voltage output of LVDT is 4.5V.

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